ESSAYS IN HONOR OF CHENG HSIAO

Edited by Tong Li, M. Hashem Pesaran and Dek Terrell

ADVANCES IN ECONOMETRICS

VOLUME 41

ESSAYS IN HONOR OF CHENG HSIAO

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INTRODUCTION

Dek Terrell, Tong Li and M. Hashem Pesaran

The collection of chapters in Volume 41 of *Advances in Econometrics* serves as a tribute to Cheng Hsiao. Throughout his long and distinguished career, Cheng Hsiao has assembled both a record of prolific research and stellar service to the profession. He has made significant contributions both in the area of theoretical as well as applied econometrics. His contributions to theoretical econometrics include: identification and estimation of structural models with measurement errors, econometric analysis of panel data models, causality testing, latent variable models, time series models, and more recently counterfactual analysis. The impact of Cheng Hsiao's research in the area of panel data models is indisputable. His Econometric Society monograph, *The Analysis of Panel Data*, Cambridge University Press (1986, now in its Third Edition), is a standard text for all students of panel data models. His early papers on the estimation of dynamic panel data models (in collaboration with A. W. Anderson) paved the way for the application of the generalized method of moments to the estimation of dynamic panels, which has now become a standard tool in empirical analysis of dynamic panels.

Cheng Hsiao has an impeccable international reputation as an all-round econometrician. He is an eminent scholar who does not shy away from practical problems. He serves as a valuable role model to young scholars on how to contribute to the profession over an academic career. His works have received more than 30,000 Google citations and cover a variety of topics in theoretical and applied econometrics. Consistent with his contributions, this volume includes chapters on a variety of topics.

In "Correction for the Asymptotical Bias of the Arellano-Bond Type GMM Estimation of Dynamic Panel Models," Yonghui Zhang and Qiankun Zhou compare a jackknife instrumental variables (JIVE) generalized method of moments estimators to standard Arellano-Bond type estimators in a dynamic panel. While the standard Arellano-Bond type estimator is biased in this setting, the JIVE of this estimator is shown to be asymptotically unbiased. Monte Carlo simulations confirm the theoretically predictions of the model and find substantial improvements in the reliability of statistical inference when the JIVE estimator is employed.

In "Testing Convergence Using HAR Inference," Jianning Kong, Peter C. B. Phillips and Donggyu Sul focus on testing σ-convergence. The chapter extends another recent work of Kong, Phillips, and Sul (2019) which proposes a test of convergence based on a simple linear trend. In particular, the chapter investigates

heteroskedastic and autocorrelation consistent (HAC), heteroskedastic and autocorrelation robust (HAR), and various sandwich estimators of the long-run variance in this setting. The asymptotic theory developed in the chapter finds that HAR models fail to match HAC variance models in terms of discriminatory power for establishing convergence. Simulations confirm this result, but also find smaller size distortions for HAR tests. The chapter also includes an application assessing convergence in unemployment rates across US states.

In "Model Selection for Explosive Models," Yubo Tao and Jun Yu derive asymptotic distributions for using information criteria for distinguishing between the unit-root and explosive models. Both the ordinary least squares (OLS) estimator and indirect inference estimator are considered using the Akaike information criterion (AIC), Bayesian information criterion (BIC), and Hannan-Quinn information criterion (HQIC) information criteria. Results indicate that the information criteria consistently choose the unit-root model when it is the true model. When explosive models are the true model, the ability of information criteria to consistently select the true model depends on the penalty term of the information criteria and how much the model deviate from the unit-root model. Simulations confirm the asymptotic results and provide additional intuition.

In another time series contribution "A VAR Approach to Forecasting Multivariate Long Memory Processes Subject to Structural Breaks," Cindy S. H. Wang and Shui Ki Wan focus on forecasting in long memory models. In particular, the authors show that a VAR(k) model can be used to approximate a vector autoregressive moving-average model with structural breaks if k is chosen appropriately. The approach offers a simpler alternative and also may yield improvements in forecasting accuracy. An application to the problem of forecasting multivariate realized volatilities of stocks is used to demonstrate the methodology.

In "Identifying Global and National Output and Fiscal Policy Shocks Using a GVAR," Alexander Chudik, M. Hashem Pesaran and Kamiar Mohaddes propose a global VAR model where both global and national shocks can be identified. The chapter considers a multicountry error correcting model with unobserved common factors in terms of reduced form global shocks. The individual country models in this chapter thus differ from the traditional VAR models in the literature, which contain domestic variables only. The global shocks are estimated using a VAR model in cross section averages. The approach is demonstrated in an application focusing on the linkages between growth in public debt and gross domestic product in a multicountry setting. The chapter finds strong evidence in favor of allowing for global shocks in country-specific VARs which explain a significant proportion of the total variance at long horizons.

In another study using cross-country panel data "The Determinants of Health Care Expenditure and Trends: A Semiparametric Panel Data Analysis of OECD Countries," Ming Kong, Jiti Gao and Xueyan Zhao investigate the determinants of health care expenditures. The authors employ semiparametric methods to estimate common and individual trends for health care expenditures using a panel of 32 countries covering the period 1990–2012. Estimates are calibrated using polynomial specifications. They find that government spending and doctor supply are positively related to health care expenditure as found in most other

panel studies. However on contrary to most prior studies, the results imply an income elasticity less than one.

In "Growth Empirics: A Bayesian Semiparametric Model with Random Coefficients for a Panel of OECD Countries," Badi H. Baltagi, Georges Bresson and Jean-Michel Etienne focus on the relationship between the growth rate of GDP per capita and growth in physical and human capital. The chapter proposes a semiparametric model with random intercept and slope coefficients and considers models with either common or country-specific trends. The empirical application uses Lee and Ward's (2016) mean variational Bayesian approach to achieve dramatic gains in computation speed. Using a panel of 23 countries over the period 1971–2015, the results fail to reject a specification of random intercept and coefficients with a semiparametric common trend.

Continuing with the focus on advances in Monte Carlo integration, Joshua C. C. Chan, Chenghan Hou and Thomas Tao Yang's "Robust Estimation and Inference for Importance Sampling Estimators with Infinite Variance" focus on the problem of Monte Carlo integration when the variance of the importance sampling estimator is infinite. In particular, the authors propose a bias-corrected tail-trimmed estimator which is consistent, has finite variance, and is asymptotically normal. The model performs well both in simulations and in an application to stochastic volatility.

In "Econometrics of Scoring Auctions," (late) Jean-Jacques Laffont, Isabelle Perrigne, Michel Simioni and Quang Vuong focus on the problem of a scoring auction with exogenous quality. They propose a structural model allowing for dependency of cost inefficiencies and qualities. Model primitives include the buyer benefit function, bidder's cost inefficiencies distribution, and cost function. Under mild functional assumptions, these model primitives are nonparametrically identified from the buyer's choice, namely, submitted bids and qualities. The chapter also proposes and provides convergence rates for a multistep kernel-based estimation procedure.

In "Bayesian Estimation of Linear Sum Assignment Problems," Yu-Wei Hsieh and Matthew Shum also implement an MCMC algorithm focused on linear sum assignment models. By exploiting the primal and dual linear programing problem for this problem, the authors provide a decomposition of the joint likelihood which results in an MCMC sampler that does not require a repeated model-solving phase. An application to an ad position auction using data from a major Chinese online shopping platform on digital camera/camcorders is used to demonstrate the algorithm.

In "The Mode Is the Message: Using Predata as Exclusion Restrictions to Evaluate Survey Design," Heng Chen, Geoffrey Dunbar and Q. Rallye Shen propose a method of estimating the impact of survey mode on individual responses to different types of survey questions. The chapter uses predata based on individual survey history which satisfy the exclusion restrictions of Newey (2007) to identify the model. An application estimates average and quantile mode effects using the 2013 Bank of Canada Method of Payments survey which was administered both by online and by mail. The empirical results fail to reject the null of no mode effect for a factual question about cash on hand. However, they

do find that the mode impacts response to a recall question with regard to number of transactions as well as a subjective question rating the importance of ease of use when considering which method of payment to choose. Overall results imply that exploiting predata information may be quite useful for survey practitioners.

In "Estimating Peer Effects on Career Choice: A Spatial Multinomial Logit Approach," Bolun Li, Robin Sickles and Jenny Williams propose a pseudo maximum likelihood approach for estimating a spatial multinomial choice model to capture the impact of peer effects on post school career decisions. Using data from the Texas Higher Education Project, the chapter defines peers based on students who are in the same classes or social clubs. Results provide strong evidence of peer effects in this sample of students and also finds that ignoring these effects leads to inaccurate estimates of determinants of career decisions.

In "Mortgage Portfolio Diversification in the Presence of Cross-sectional and Spatial Dependence," Timothy Dombrowski, R. Kelley Pace and Rajesh P. Narayanan investigate the impact of default rates on the correlation of mortgage returns. Intuitively, returns to mortgages are fixed if no defaults occur and there is no correlation among mortgages in a portfolio. If all default, the correlation among mortgages is simply the correlation in prices. Based on this observation, this chapter uses the literature on censored random variables to build a model for the diversification of mortgage portfolios. The results provide intuition on how both cross-sectional and spatial dependence of mortgages vary by both default rates and geography.

The volume concludes with a look into the future by Cheng Hsiao in his "An Econometrician's Perspective on Big Data." The contribution begins by laying out the key areas where big data might be employed to increase our understanding of problems in economics and finance. He then turns to methodological challenges in the big data arena. Comments by Thomas B. Fomby and Georges Bresson offer additional perspective on big data issues and conclude this volume.

REFERENCES

Kong, J., Phillips, P. C. B., & Sul, D. (2019). Weak σ-convergence: Theory and Applications. *Journal of Econometrics*, *209*, 185–207.

Lee, C. Y. Y., & Wand, M. (2016). Streamlined mean field variational Bayes for longitudinal and multilevel data analysis. *Biometrical Journal*, *58*(4), 868–895.

Newey, W. K. (2007). Nonparametric continuous/discrete choice models. *International Economic Review*, *48*(4), 1429–1439.